



INSTALLATION & OPERATING INSTRUCTIONS

SIMHA 2.0 UNIVERSAL DRIVE



India : Toll Free No. 1800 103 5555

Other Countries : +91-7292 410500

SHAKTI PUMPS (INDIA) LIMITED

Plot No. 401, 402, & 413, Industrial Area, Sector - 3, Pithampur - 454774,
Dist. - Dhar, (M.P.) - INDIA, E-mail: info@shaktipumps.com
Visit us at : www.shaktipumps.com

11 Nov / 2021 / R3 Nov/2021-22/L3/000 | VC : 7000277 | SAP No. : 2000018016

| CONTENT | PAGE NO. |
|--|----------|
| Preface..... | 01 |
| CHAPTER 1: SAFETY INSTRUCTIONS | |
| 1.1 Pre-Installation Safety Measures..... | 02 |
| 1.2 Installation Safety Measures..... | 02 |
| 1.3 Safety during Operation..... | 03 |
| CHAPTER 2: INTRODUCTION | |
| 2.1 Product Overview..... | 04 |
| 2.2 Caution..... | 05 |
| 2.3 Receiving & Inspection | |
| 2.3.1 Model Explanation..... | 05 |
| 2.3.2 Terminal Connection..... | 05 |
| 2.3.3 Items Inside the Drive Box..... | 06 |
| 2.3.4 2.3.4 WIFI/GPRS DB9 Connector | 07 |
| 2.3.5 Shakti RMS/IoT dongle*..... | 08-09 |
| 2.3.6 Specification | 10 |
| 2.3.7 Drive Frames and Appearances..... | 11 |
| 2.3.8 Simha 2.0 with Change Over Switch..... | 12-13 |
| 2.3.9 DC Circuit Breaker and SPD Box..... | 13-14 |
| Connection Diagram..... | 14 |
| Connection Diagram for unbalanced PV strings..... | 15 |
| CHAPTER 3: INSTALLATION AND WIRING | |
| 3.1 Guidelines for installation and wiring..... | 16 |
| CHAPTER 4: BASIC OPERATION | |
| 4.1 LCD Module Descriptions..... | 17 |
| 4.2 Button Description..... | 17 |
| 4.3 LCD Operation..... | 18-26 |
| CHAPTER 5: FAULT DIAGNOSIS AND SOLUTION | |
| 5.1 Fault Type..... | 27 |
| 5.1.1 Fault information and description in detail..... | 28 |
| CHAPTER 6: MODBUS COMMUNICATION PROTOCOL | |
| 6.1 COM Port Setting..... | 29 |
| 6.2 RTU Frame Structure..... | 29 |
| 6.2.1 Function Code..... | 29 |
| 6.3 MODBUS Address..... | 30-33 |
| CHAPTER 7: RECYCLING AND DISPOSAL | |
| Warranty | |
| Service..... | 35 |
| Warranty Card..... | 36 |

* Only applicable in which dongle is available

Preface

Thank you for choosing Shakti's Simha 2.0 Universal Drive. We are pleased to provide you a product that incorporates the latest technology and exceptional services to the customers.

This manual includes information for installation, maintenance, and safety of the drive. Please read the instructions of this manual carefully to ensure equipment's proper functioning and personal safety.

The images of the product shown are only for illustration the original product may vary.

In this manual company refers to Shakti Pumps India Ltd. Our contact details are given on the last page.

Please check the latest version at www.shaktipumps.com



Fig.1 Simha 2.0 Universal Drive

CHAPTER 1 : SAFETY INSTRUCTIONS

⚠ WARNING! Ignoring the following instructions can cause damage to the equipment or physical injury or in some cases death.

1.1 Pre-Installation Safety Measures

1. Before using the unit, read all the instructions and cautionary markings, on the unit and all its appropriate sections.
2. The gross weight of the equipment is close to 6 Kg. Kindly lift the drive carefully.
3. Please check the condition of the package and look for any sign of damage. Don't use the damaged or incomplete drive.
4. Customers are NOT authorized to open the drive or to do any kind of modification, or repair, otherwise, there is a danger of shock and loss of warranty.
5. To store the drive, kindly follow instructions given in chapter 2.

1.2 Installation Safety Measures

1. Installation should be done in the presence of a professional technician. Safety equipments such as shoes, helmets, and gloves should be used by the technician.
2. Installation of the drive should be carried out on a solar structure with proper ground clearance and specified nuts and bolts.
3. Install the drive on metal or other non-flammable material, and keep it away from any combustible material.
4. The drive should not be installed inside a closed chamber, to ensure proper heat dissipation. Ignoring this will result in malfunctioning of drive and loss of warranty.
5. Before starting wiring and connections make sure that PV panels, drive, motor, and all other accessories are properly fitted on their designated place.
6. Ensure that the drive, motor, and adjoining equipment are properly earthed to reduce electromagnetic emission and interference.
7. Make sure that earth conductors are adequately sized as required by safety regulations.
8. Make sure that the voltage grade of the power supply is consistent with the drive's voltage. Also, note that all PV panels are connected in series or parallel as per system's requirement in order to have required voltage fed to the drive.
9. There must not be any loose connection. Make sure that all insulations are proper in order to prevent any damage/injury. Also periodically inspect insulation in case of a bad weather.
10. Make sure that earthing wire is connected with drive. The wire diameter should be 4sq. mm and color coded is yellow-green or green.

11. Check whether the wiring is correct and firm, there should not be any short circuit in the peripheral equipment's circuit.
12. Ensure that the output of the drive is turned off while setting all the required parameters.
13. For the drives whose storage time is over 1 year, when electrification, the voltage should be raised by booster from low to high. Otherwise it may damage the drive.
14. Ensure that no unauthorised filter is connected to the output of the drive. It may cause loss of warranty.
15. No magnetic switch or magnetic contactor should be connected to the output circuit of the drive, when drive is in the operation with load, magnetic switch or magnetic contactor can falsely trigger the over-current protection function leading to mal-operation of the system.

1.3 Safety during Operation

1. Make sure that the ratings of the pump, motor, and drive comply with each other.
2. The cooling fan or the heatsink should not be touched otherwise there is a danger of getting burnt.
3. Do not operate or touch the drive with the wet hand.
4. Do not put any of your belongings like mobile etc. on the drive.
5. Disconnect PV power from the drive under the supervision or presence of a trained electrician.
6. It is mandatory to disconnect input power before starting any maintenance work.
7. After the input is disconnected from the drive, wait for at least five minutes so as to allow the internal capacitors to get discharged for the safety of operation.
8. Do not conduct any insulation or voltage withstands tests on the drive.
9. At over 1,000 metres altitude, the drive's heat dissipation function deteriorates, therefore, use proper derating.
10. Untrained workers are banned to check the signals in the running stage.
11. Remove the PV power supply only after the electric machine stops running.
12. The load should be motor or pump. Any other load may cause heating or burn the device
13. The solar panel and drive should be clean once in a three months for proper operation of the drive.

Attention

1. The DC connection terminals PV+ and PV- carry a dangerous DC voltage of up to 800V.
2. At the drive input, the photovoltaic cells generate DC voltage even at low intensity of sunlight.
3. While cabling, make sure that it does not come in the path of any other work e.g. harvesting or digging.
4. If there is any abnormality kindly contact our customer care.
5. The drive and its heat sink may be at a relatively higher temperature than the ambient.
6. The drive output is pulse wave type. If a digital multimeter is used for measurement then there could be a large deviation in the measurement, and these deviations would be different for different kinds of digital multimeters.
7. Improper wiring and utilization or unauthorized alteration may result in damage to drive or other equipment, users will be responsible for the cause and there will be a loss of warranty.

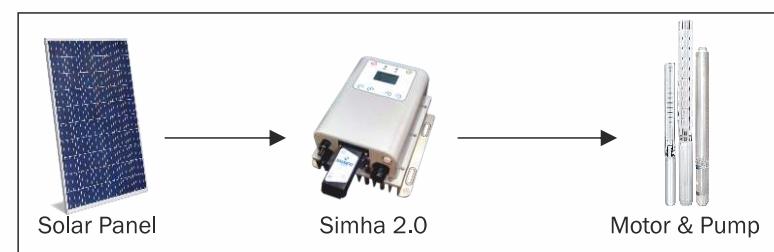
CHAPTER 2 : INTRODUCTION

2.1 Product Overview

Shakti's Simha Universal Drive 2.0 is a unique product designed, developed and manufactured in India. SIMHA series are three phase variable frequency drive compatible with solar power system.

SIMHA Drive 2.0 can convert the DC generated by solar panels into AC, which is in accordance with current required to drive motor.

Note : No internal or external isolation transformer is required.



| Name | Description | Remarks |
|------|--------------|--|
| A | Solar panels | Monocrystalline or polycrystalline silicon, and thin-film PV modules |
| B | VFD | SIMHA 0.75HP, 1HP, 2HP, 3HP, 5HP, 7.5HP, 10HP |
| C | Motor | AC-IM, PMSM, IPMSM & S4RM |

2.2 Caution

Measures to be taken for drive storage

- ✓ The solar variable frequency drive should be kept in the shipping carton or crate before installation.
- ✓ Storage area should be clean, dry, and free from direct sunlight or corrosive fumes.
- ✓ Storage area has an ambient temperature range of -20 °C to 60 °C.
- ✓ Storage area has a relative humidity range of 0% to 90% and non-condensing environment.
- ✓ Storage area has an air pressure range of 85kPa to 107kPa.

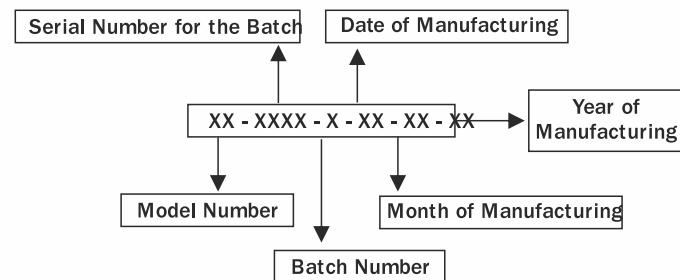
DO NOT store

- ✗ In an area with the rapid change in temperature (condensation and frost may be caused).
- ✗ In a place with lots of water leakage.
- ✗ In a place which has a high risk of fire ignition.
- ✗ Do not dispose of batteries in a fire. The batteries may explode.
- ✗ Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

NOTE: If storage of drive is for more than 3 months then ensure that temperature should not be more than 30° C. Storage more than a year may reduce the lifespan of drive.

2.3 Receiving and Inspection

2.3.1 Model Explanation



2.3.2 Terminal Connection

| Terminal Description | Standard Symbol | To be Used as |
|----------------------|-----------------|---------------|
| Line | L | R |
| Neutral | N | Y |
| Earth | PE | B |

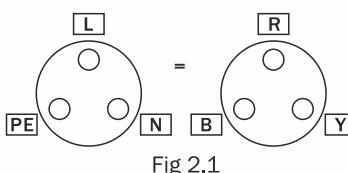


Fig 2.1

2.3.3 # Items Inside the Drive Box



| S. No. | Item Name | Qty. | Manufacturer Part Number | Manufacturer Name |
|--------|--|------|--------------------------|-------------------|
| 1 | Simha Universal Drive 2.0 | 1 | | |
| 2 | Changeover Switch (1 Phase / 3 Phase)* | 1 | | |
| 3 | DC Circuit Breaker & SPD Box* | 1 | | |
| 4 | Input PV Connector (M) | 1 | FCI-10145487-M/F-001LF | Amphenol |
| 5 | Input PV Connector (F) | 1 | FCI-10141432-M/F-001LF | Amphenol |
| 6 | AC Input Connector* | 1 | VPAC07EW-3S6 | Vacon |
| 7 | Output Connector | 1 | VPAC06EW-3P(SC) | Vacon |
| 8 | PV 2-Way Branch Connector (M)* | 1 | ESC-BC-S2P1-X | Elcom |
| 9 | PV 2-Way Branch Connector (F)* | 1 | ESC-BC-S1P2-X | Elcom |
| 10 | Hex Bolt (M8X40MM), Nut M8, Washer M8 | 4 | Standard | |
| 11 | User Manual | 1 | | |

* only with certain models

The Accessories varies based on the various models & configuration.

Note : The internal battery is Coin cell, 20.0mm Lithium 3V Non-Rechargeable (Primary). The battery can not be replaced & the battery life is 5 years .

| |
|-------------------------|
| 1 4 7 10 13 16 19 22 25 |
| 2 5 8 11 14 17 20 23 26 |
| 3 6 9 12 15 18 21 24 |

PIN POSITION

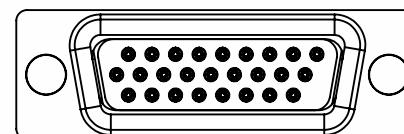


Fig 2.2 - COM Port *

| PIN | NAME | PIN | NAME |
|-----|------------|-----|-------------|
| 1 | PLC_COM | 14 | PLC_IN3 |
| 2 | CGND | 15 | PLC_IN2 |
| 3 | DRY1_COM | 16 | PLC_IN1 |
| 4 | DRY 2 _COM | 17 | PLC_Vin_SNS |
| 5 | DRY 1 _NC | 18 | PLC_in_SNS |
| 6 | DRY 2 _NC | 19 | V2 Vout_PLC |
| 7 | DRY 1 _NO | 20 | V2 Iout_PLC |
| 8 | DRY 2 _NO | 21 | RS485_B |
| 9 | PLC_IN8 | 22 | RS485_A |
| 10 | PLC_IN7 | 23 | CGND |
| 11 | PLC_IN6 | 24 | TOG_SW1 |
| 12 | PLC_IN5 | 25 | +24V_ISO |
| 13 | PLC_IN4 | 26 | CGND |

26 Pin connector is optional. In case of solar drive one digital and one analog sensor is available in the same place.

2.3.4 WIFI/GPRS DB9 Connector

Connect IoT dongle or RS 232 to USB Simha 2.0 cable to this port for recording and observing data from the Simha 2.0 on online portal. When the dongle is connected it sends recorded data of all the parameters used in operation of the unit. But if some specific parameter is required to be observed RS 232 to USB converter cable can be connected and data corresponding to a particular address according to the table 6.2 can be accessed.

NOTE: The Pins 1 & 5 of the DB9 Connector are the source pins of 5 V at few milliamperes current. These pins cannot be used as sink even for a single millampere current.

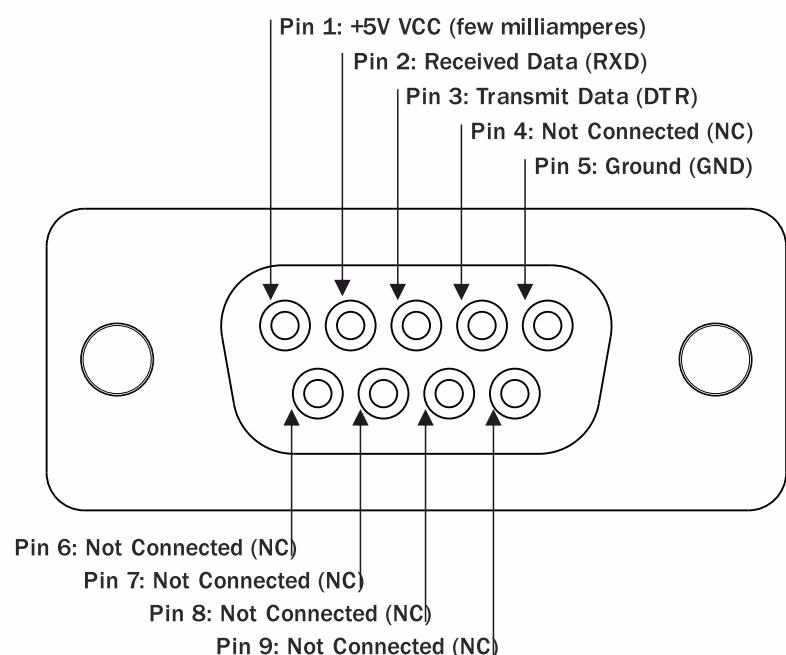


Fig. 2.2 RS232 Connector

2.3.5 SHAKTI RMS/IoT DONGLE

Remote Monitoring and Control
In-built Data Logger & RTC
Compatible with GSM, WiFi & Bluetooth

1. Product Appearance

Status Indicator

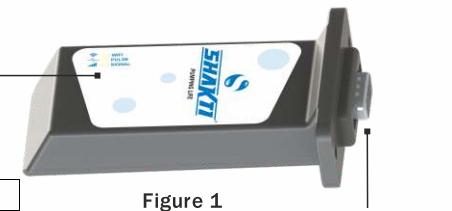


Figure 1

Status Indicator:

| | | |
|--------------------|-----------------------|----------------------------------|
| Pulse LED(Green) | Blink in every second | Normal |
| | Constant ON/OFF | Abnormal |
| Signal LED (RED) | ON | Normal (signal strength good) |
| | OFF | Abnormal (Signal low / Zero) |
| Wi-Fi LED (yellow) | ON/ Blink | Normal |
| | OFF | No WiFi Network |

2. Installation and Connection:

For installing the SHAKTI IoT dongle.
Follow these steps :

Step1: Remove the cover and take out the motherboard.



Figure 2

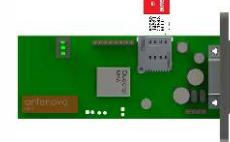


Figure 3

Step2:
Insert SIM card as per the correct direction marked.



Figure 4

Step3:
Put the motherboard back into the enclosure.

Step 4:

Insert the dongle into DB9 port and use two M3x10 screws to fix the dongle along with gasket.

3. Configuration

Step1: Connect the "Shakti IoT dongle" to the main device and check the "pulse LED" (green) blinking in every second.

Step2:

If the SIM card is present in the "Shakti IoT dongle" and 2G network is available in that area the Signal LED (RED) will be ON.

(*Note* it will be ON only in good signal strength).

Step3:
To configure the Wi-Fi follow these steps:3.1)

Turn ON Wi-Fi on your Mobile and select "SHAKTI_DONGLE and connect it with the password "shakti123".

An HTML page will open in your browser otherwise browse <http://192.168.4.1>. You will get the HTML page like this:



Figure 6

3.2) Now "Configure Wi-Fi" now new page will open like this:



Figure 7

3.3) Select your preferred WiFi with proper password and then save. In case your WiFi network is not visible in the list scan again.

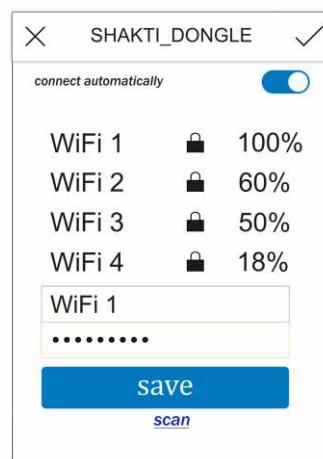


Figure 8

On successful configuration, WiFi LED (yellow) will be ON.

*** NOTE***

- Shakti IoT Dongle is designed to work with GSM on priority, WiFi is always secondary.
- For using WiFi remove SIM card then connect shakti dongle.
- On successful TCP connection WiFi yellow LED will blink in every second.

4. Troubleshooting

- If Pulse LED is constantly ON/OFF, check main device power supply or restart the device.
- If signal LED not glowing, check sim card / signal strength.
- If WiFi LED not glowing, check WiFi network / reconfigure WiFi settings.

5. Contact Shakti to integrate IoT Dongle to other products & solutions.

2.3.6 Specification

| Product | SIMHA UNIVERSAL DRIVE 2.0 | | | | | | |
|-----------------------------------|---|--------------------|-------------------|--|----------------------|--------------------|-------------------|
| Power | 0.75 HP | 1 HP | 2 HP | 3 HP | 5 HP | 7.5 HP | 10 HP |
| Input (DC) | | | | | | | |
| AC Voltage range (if applicable)* | 207-245 VAC (1-φ) | 90-245 VAC (1-φ) | 90-245 VAC (1-φ) | 200-440 VAC (3-φ) | 200-440 VAC (3-φ) | 360-460 VAC (3-φ) | 360-460 VAC (3-φ) |
| Min. DC Voltage | 40 V | 70 V | 90 V | 200 V | 200 V | 200 V | 200 V |
| Max. DC Voltage** | 360 V | 360 V | 360 V | 720 V | 720 V | 720 V | 720 V |
| Nominal DC Voltage | 75 V | 111 V | 222 V | 400 V | 600 V | 400 V | 600 V |
| Start Voltage | 30 V | 30 V | 30 V | 200 V | 200 V | 200 V | 200 V |
| MPPT Voltage Range | 60 -150 V | 90-180 V | 90-360 V | 200-450 V | 300-720 V | 250-550 V | 300-720 V |
| Max. DC Input Current | 10 A | 10A | 10A | 10A | 10A | 20 A | 20 A |
| Max. Power at DC Side | 1200 W | 1200 W | 2000 W | 3000 W | 5000 W | 7500 W | 10,000W |
| No. of MPPT | | | | 1 | | | |
| No. of PV Strings | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Output (AC) | | | | | | | |
| Nominal AC Voltage Range | 0-120 VAC | 0-120 VAC | 0-200 VAC | 0-460 V | | | |
| Frequency | | | | 0-400 Hz | | | |
| Max. AC current | | | 12A | | | 20A | |
| Rated Power at AC Side | 750 W | 850 W | 1700 W | 2900 W | 4700 W | 6400 W | 9300 W |
| Power Factor | 0.8 lead to 0.8 lag | 0.7-1 at full load | | | 0.7-0.9 at full load | | |
| THD- | 70-150% | 70-150% | 70-150% | 70-150% | 70-150% | 70-150% | 70-150% |
| slope- | 4000 V/uS | 4000 V/uS | 4000 V/uS | 7200 V/uS | 7200 V/uS | 7200 V/uS | 7200 V/uS |
| Peak- | 400 V | 400 V | 400 V | 750 V | 750V | 750 V | 750 V |
| Connection Phases | | | | 3-Phase | | | |
| Efficiency | | | | | | | |
| Max. Efficiency | >90 % | >92% | >93% | >95% | | >96% | |
| MPPT Efficiency | | | | >99% | | | |
| Protection | | | | | | | |
| Short Circuit Protection | | | | 60 A | | 90 A | |
| Lighting/Surge Protection | | | | 4 kV | | | |
| Over Temperature | | | | 80 °C | | | |
| Over Current | | | 12A/ User defined | | | 20A / User defined | |
| Over Voltage | 300 V | 420 V | 420 V | 720 V | 720 V | 720 V | 720 V |
| Dry Run | | | | Yes, Depends on Load Parameters | | | |
| Insulation Protection | | | | Protective Class (I) | | | |
| Ingress Protection | | | | IP 65 | | | |
| Pressure Vent | | | | 70 mBar for 4000 ml/min | | | |
| Interface | | | | | | | |
| Input Connection (DC) | | | | MC4 | | | |
| Y Connection Connector | | | NO | | | YES | |
| Output Connection (AC) | | | | Plug in Connector | | | |
| LCD Display | | | | Graphical LCD (128 X 64 Pixels) | | | |
| Display Language | | | | English | | | |
| General Data | | | | | | | |
| Topology | | | | Three Phase two level VSI | | | |
| Cooling Method | Natural Cooling | | | Forced Cooling | | | |
| Ambient Humidity | | | | 0-90% | | | |
| Altitude | | | | <1000 m | | | |
| Mounting | | | | Vertical (Max. 15 degrees from vertical) | | | |
| Noise (dB(A)) | | | | <20 dB(A) | | | |
| Pollution Degree | | | | PD3 | | | |
| Over Voltage Category | | | | Category (II) | | | |
| Operating Temperature Range | | | | -20°C to 70°C (45°C to 70°C with derating) | | | |
| Dimensions (L*W*H) | | | | 270X280X146 mm^3 | | | |
| Net Wt. / Gross Wt. | | | | 6.5/7.5 Kg | | | |
| Standard Warranty | | | | 1 Year | | | |
| Certificates | IEC 61683, IEC 600682-2-(1,2,14,30), IS 16221-2(IEC 62109-2), IEC 60529, EN 50530 | | | | | | |

* The AC input voltage is applicable for General Purpose Drives (GPD) only.

** Max. DC Voltage may change refer sticker parameter for final value.

2.3.7 Drive Frames and Appearances

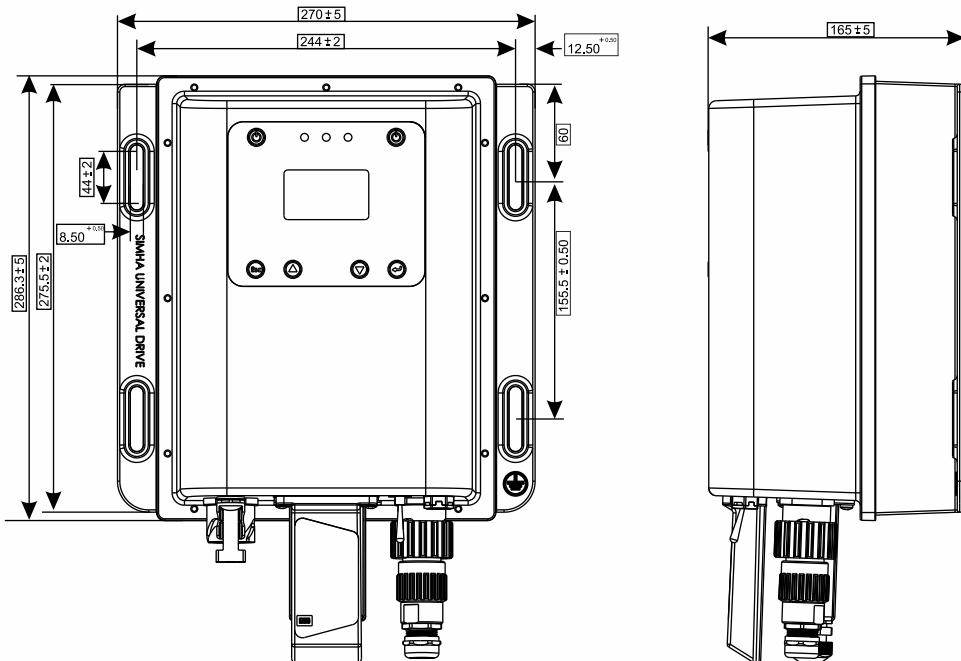


Figure 2.4 Drive top and side view

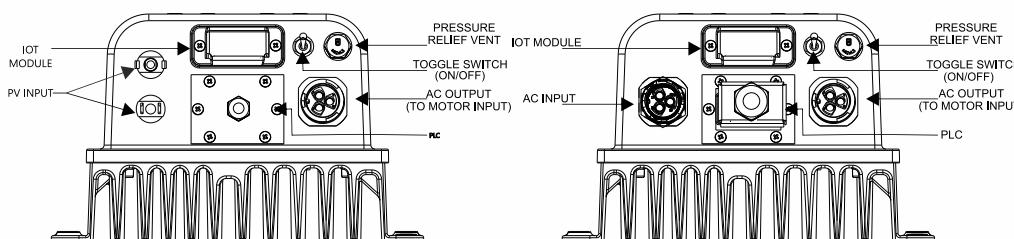


Figure 2.51 Drive front view for solar drive

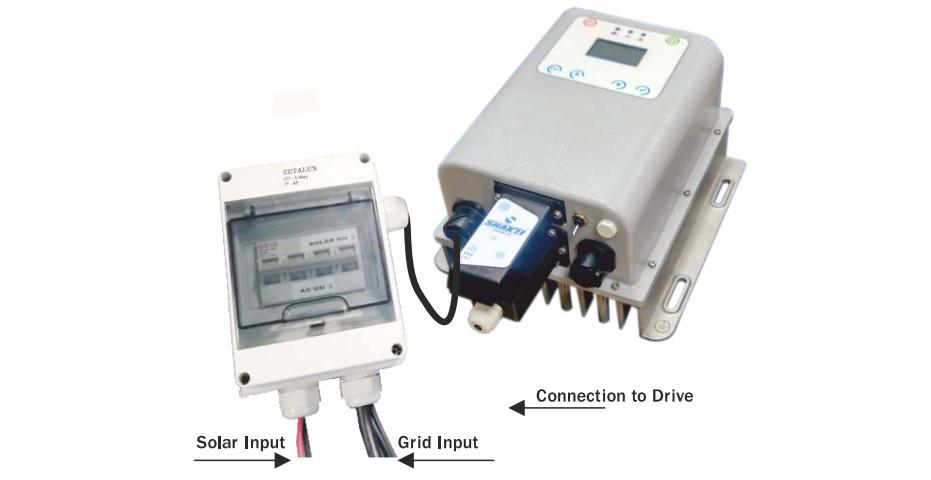
2.52: Drive front view for GPD

2.3.8 Simha with Change Over Switch

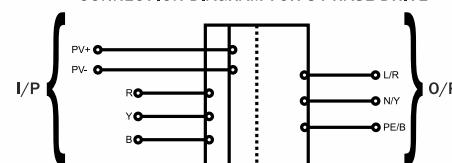
The change-over switch provided with this model of SIMHA Universal Drive 2.0 is a dual input single output device, which is used to change the input power source to the controller. It is generally used with controllers/drives which have options to run from solar as well as from grid. There are three operative positions in change-over switch corresponding to S1, S2, (Up and Down) & M (Middle). In the case of S1 and S2 positions, the corresponding sources are connected to output whereas in M position none of the sources are connected to output. Conventionally, the name of the sources is marked in S1 and S2 position for the convenience of the user. The change-over switch is provided in a dust and rainproof IP 65 rated box.

Note: It should be noted that while changing the power source through change-over the M position should be used until the display of the controller turns off. This intermediate use of the M position avoids inrush currents through the changeover switch and improves its life.

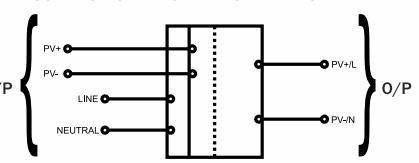
Below 2 HP: Single Phase Grid Input
Above 2 HP: Three Phase Grid Input



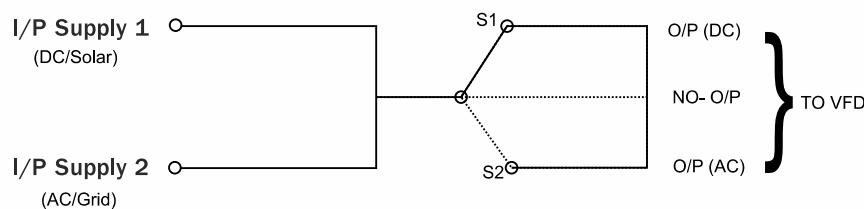
CONNECTION DIAGRAM FOR 3-PHASE DRIVE



CONNECTION DIAGRAM FOR 1-PHASE DRIVE



* Product Image shown for reference only.



2.3.9 DC Circuit Breaker and SPD Box

SPDs (Surge Protection Device) are designed to limit transient over voltages due to lightning or switching and divert the associated surge currents to earth, so as to limit these over voltages to levels that are unlikely to damage the electrical installation or equipment. This device is connected to the power supply in parallel with the loads (circuits) that it is intended to protect.

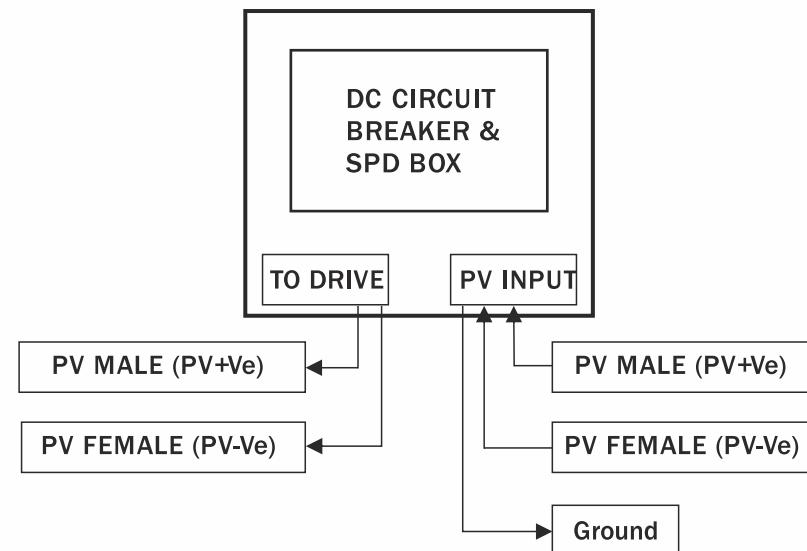
In addition to safety, the surge protectors dedicated breaker performs the following functions:

- Allows power to the protector to be removed without interrupting power to other loads.
- Should a component fail inside the protector, only the protector's breaker will trip, and power to other loads is not disturbed.

MODELS:

1. For VFD (1HP-5HP) - DC Circuit Breaker & SPD Box_16 Amp
2. For VFD (7.5HP & 10HP) - DC Circuit Breaker & SPD Box_25 Amp

CONNECTION DIAGRAM



Connection Procedure for Unbalanced PV Strings

The new simha drive provides a feature to connect unbalanced strings without circulating currents between the strings. In order to achieve this without a DC disconnect switch (MCB), one needs to short the negative of both the strings and connect it to the "L" terminal of the input connector. The two positives can be connected to the "N" and "PE" terminals of the input connector as shown in Fig. 1. If an input DC disconnect switch is used then the negative of both the PV strings should be shorted and given to the first terminal of three poles MCB (named PV-). The positive of both the strings should be given to the other two terminals. The output connection from the MCB should ensure that the negative of the PV strings get connected to the "L" terminal or black wire of the three pin input connection of the drive as shown in Fig. 2.

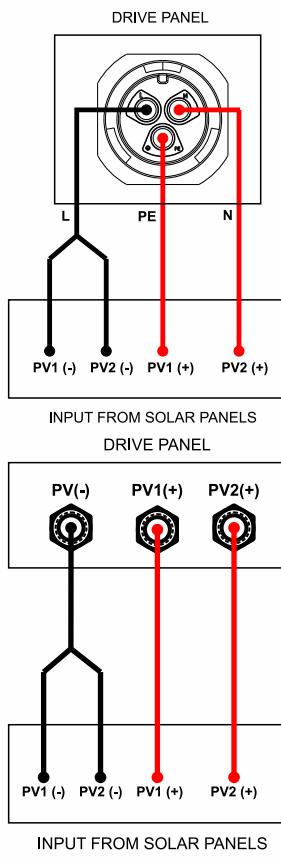


Fig. 1 - Connection configuration to drive

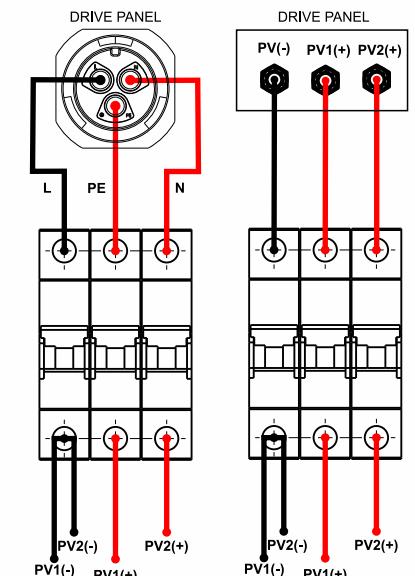


Fig. 2 - Connection configuration to drive via input MCB

CHAPTER 3: INSTALLATION AND WIRING

Installation of the drive is simple with effortless wiring connections for Simha Universal Drive. Its DC input has poka-yoke connectors i.e. wrong connection is not possible by virtue of its construction. The drive works properly even in case of reverse polarity connection.

3.1 Guidelines for installation and wiring

1. The drive should be taken out of the packing box properly keeping in mind its weight.
2. Installation of drive should be carried out on solar structure with proper ground clearance and specified nuts and bolts.
3. Install it vertically on the pole (maximum inclination allowed is 15 degrees only).
4. Pay attention to the installing place to guarantee the effective heat dissipation.
5. Screw the nuts and bolts and make sure they tightened nut and bolt properly. Connect the earthing wire at the bolting place.
6. Connect the plug in PV inputs to the drive. Please refer labeled diagram of drive.
7. After that follow instructions given in chapter 4 of this manual.
8. Connect the output plug in connector to the load.

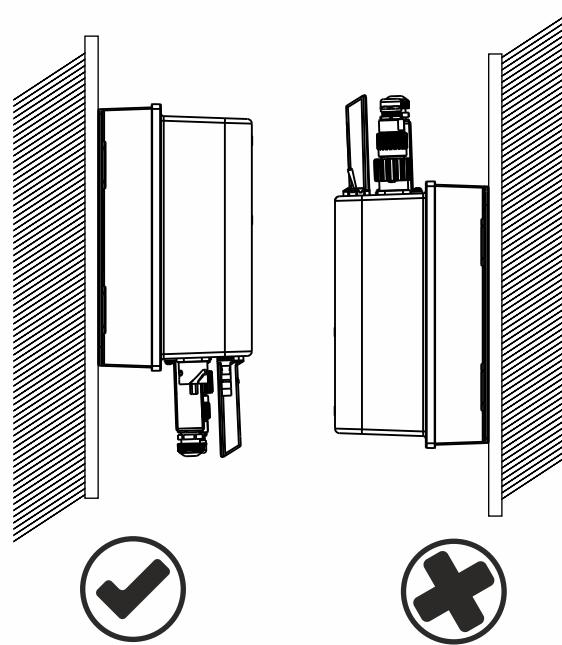


Figure 3.1 Correct and Incorrect installation of drive

CHAPTER 4: BASIC OPERATION

4.1 Display Module Description

Following figure 4.1 is indicates the outer look of Display. It has six buttons, three LED indicators, one 126.5X105.5 mm LCD Display.

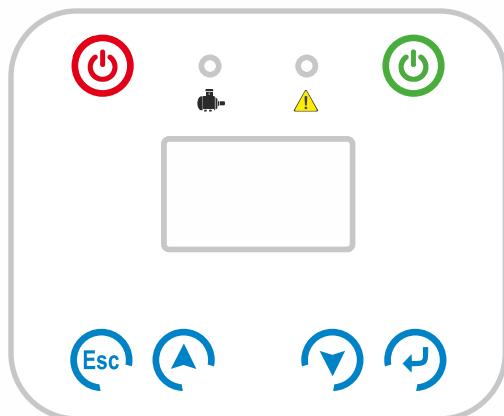


Figure 4.1 LCD Module

4.2.Button Description and Operation

| Button | Functionality |
|--|--|
| Power  | <ul style="list-style-type: none"> To Turn ON the Motor |
| Power  | <ul style="list-style-type: none"> To Turn OFF the Motor |
| ESC  | <ul style="list-style-type: none"> Previous Screen |
| UP Arrow  | <ul style="list-style-type: none"> Used for Scrolling up For increasing the parameter values in Configuration menu |
| Down Arrow  | <ul style="list-style-type: none"> Used for Scrolling down For decreasing the parameter values in Configuration menu |
| ENTER  | <ul style="list-style-type: none"> Selection |

4.2 LCD Operation

- Startup

Upon starting the unit for the first time, the LCD Display enters into Factory Setup interface. In factory setup, the user gets an option to set various parameter required for the proper functioning of the product which are illustrated in the figure 4.2.

Scroll through various options displayed on the screen with the up & down buttons and press Enter to set the parameter and Esc to exit the particular option. The Date & INSTALL DATE are set in the format DD/MM/YY and the Time in HH:MM:SS. Other options are common to factory setup option in main menu therefore, are discussed in section c of CONFIGURE.

After the successful starting of the product or whenever the LCD is not operated for a period of time, 6 status screens appears in rolling until menu button is pressed.

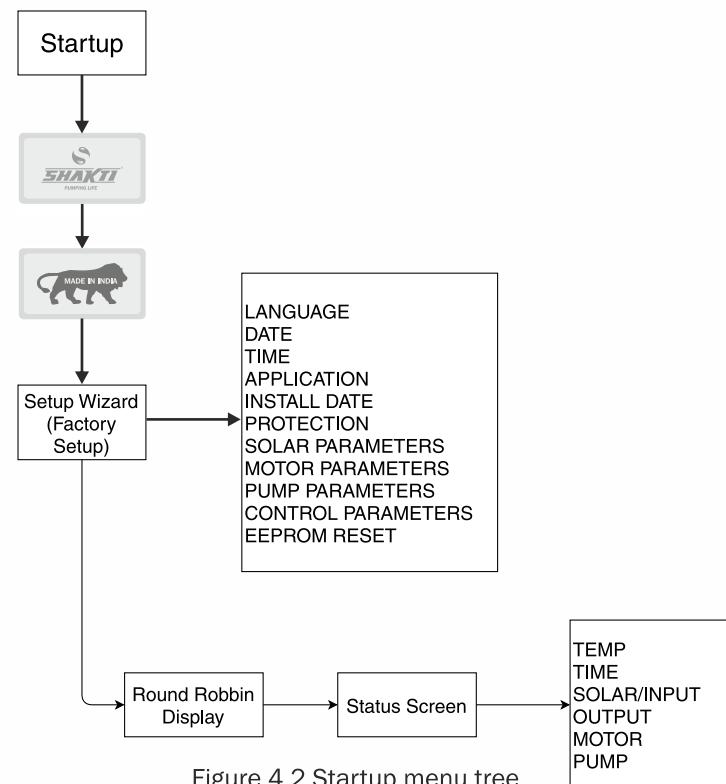


Figure 4.2 Startup menu tree

INSTALLATION & OPERATING INSTRUCTIONS

- Main Menu

In the main menu user can change the setting or get information by transferring from one interface to another. The STATUS, CONTROL, and CONFIGURE, are discussed separately in further sections. FAULT LOG, Rs232 extract and RS485 extract data can be viewed in LOGS. The ABOUT section provides the information of firmware version, serial number & network details.

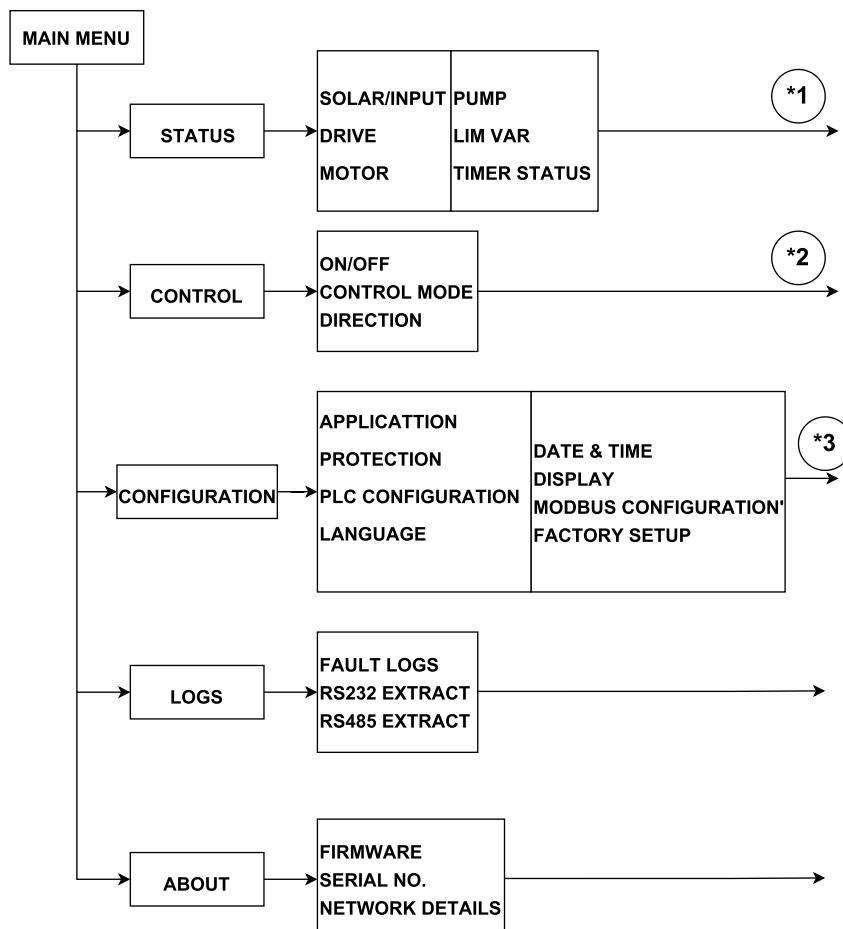


Figure 4.3 Main menu tree

INSTALLATION & OPERATING INSTRUCTIONS

► STATUS (*1)

a) SOLAR/INPUT

This status shows either the real time parameters of SOLAR or INPUT depending upon the APPLICATION selected. In SOLAR mode the real time PV condition of the system, such as input voltage (V), input current (A), input power (W), open circuit voltage (V), short circuit current (A), maximum power (W), MPP voltage (V), and cumulative energy (kWh) are visible in status. Similarly, in case of INPUT mode parameters are: as input voltage (V), input current (A), input frequency (Hz).

b) DRIVE

This status shows the real time condition of Variable Frequency Drive of the system, such as output voltage (V), output current (A), output frequency (Hz), and output power (W).

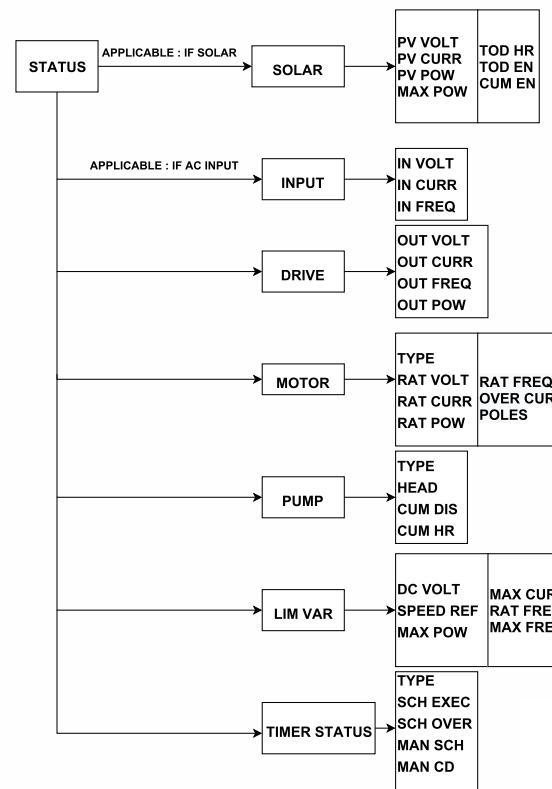


Figure 4.4 STATUS menu tree

| <p>INSTALLATION & OPERATING INSTRUCTIONS</p> | <p>INSTALLATION & OPERATING INSTRUCTIONS</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---------|--|--------|----|------------|---|-----------------------------|----|-----------|---|--------------------------------|----|---------|---|--------------------------------|----|----------|---|------------------------------------|----|------------|---|--|----|----------|---|--|--|
| <p>c) MOTOR</p> <p>This status shows the real time data of the Motor driving the pump, such as type of the motor selected for operation, rated voltage (V), instantaneous current (A), rated power (HP), rated frequency (Hz), operating speed (RPM), and number of poles.</p> <p>d) PUMP</p> <p>This status shows the real time PUMP condition connected to the system, such as type of the pump, head (m), cumulative discharge (kL), and cumulative hour (Hr).</p> <p>e) Limit VAR</p> <p>This status shows the speed limit indication. Used by authorized technician/service personnel to debug the cause of speed limit. Their corresponding flag indicates 0 or 1. 0 indicates the following reason is not responsible for the speed limit and vice versa. These are the following reasons for the speed limit:</p> <table border="1" data-bbox="156 923 940 1173"> <thead> <tr> <th>S.No.</th> <th>Reasons</th> <th>FLAG</th> <th>Detail</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>DC voltage</td> <td>1</td> <td>DC voltage limits the speed</td> </tr> <tr> <td>2.</td> <td>Speed Ref</td> <td>1</td> <td>speed reaches to its set speed</td> </tr> <tr> <td>3.</td> <td>Max Pow</td> <td>1</td> <td>power reaches to set max power</td> </tr> <tr> <td>4.</td> <td>Max Curr</td> <td>1</td> <td>current reaches to set max current</td> </tr> <tr> <td>5.</td> <td>Rated Freq</td> <td>1</td> <td>frequency reaches to set rated frequency</td> </tr> <tr> <td>6.</td> <td>Max Freq</td> <td>1</td> <td>frequency reaches to set max frequency</td> </tr> </tbody> </table> <p>f) Timer Status</p> <p>This status indicates the flag for timers, which are given below:</p> <p>Type of timer: Scheduler type or Countdown type</p> <p>Schedule execution: When the scheduler is executing that time this flag shows 1 otherwise 0.</p> <p>Scheduler Over: When scheduler execution completes this flag goes to 1.</p> <p>Manual Scheduler: This indicates the manual start-up in scheduler mode.</p> <p>Manual countdown: This indicates the manual start-up in countdown mode.</p> | S.No. | Reasons | FLAG | Detail | 1. | DC voltage | 1 | DC voltage limits the speed | 2. | Speed Ref | 1 | speed reaches to its set speed | 3. | Max Pow | 1 | power reaches to set max power | 4. | Max Curr | 1 | current reaches to set max current | 5. | Rated Freq | 1 | frequency reaches to set rated frequency | 6. | Max Freq | 1 | frequency reaches to set max frequency | <p>► CONTROL *2</p> <p>a) ON/OFF</p> <p>Whenever ON option is selected the motor will turn on until it is turned off manually or when some fault is generated.</p> <p>b) CONTROL MODE</p> <p>The motor can be operated in any of the four modes: AUTO, MANUAL, SPEED CONTROL, JOG & Timer control. If SOLAR is selected in APPLICATION, JOG mode can be accessed. But if APPLICATION is GRID, SPEED CONTROL mode is available. To start the motor in JOG mode press Enter button inside the ENTER THE JOG option, Until the Enter button is pressed motor is in running state. Releasing the button will lead to stopping of the motor.</p> <p>In TIMER CONTROL the “ON” time of motor is controlled based on the inbuilt timer of the device. The timer has two modes : countdown and scheduler, which can be selected via type of timer. The instant of turn ON and duration can be configured in the scheduler configuration menu of the timer.</p> <p>Countdown Type: In this mode, the motor is started manually by pressing ON button in the display or via mobile app. Once the motor has started, a countdown corresponding to duration is managed and displayed. The maximum duration can be set up to 999 minutes.</p> <p>Scheduler Type: In this mode the motor start time and duration can be set for a week which will repeat in round robin.</p> |
| S.No. | Reasons | FLAG | Detail | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | DC voltage | 1 | DC voltage limits the speed | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Speed Ref | 1 | speed reaches to its set speed | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Max Pow | 1 | power reaches to set max power | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Max Curr | 1 | current reaches to set max current | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Rated Freq | 1 | frequency reaches to set rated frequency | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Max Freq | 1 | frequency reaches to set max frequency | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

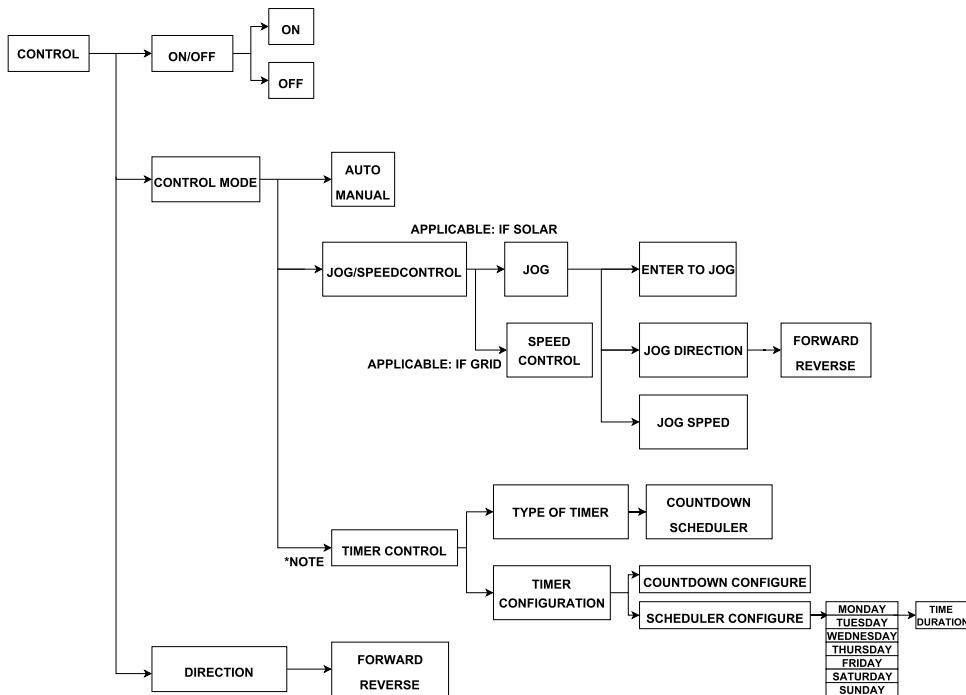


Figure 4.5 Control menu tree

▶ CONFIGURE (*3)

- a) APPLICATION - This system can work for three applications: Solar & Grid.
- b) PROTECTION - The protection limit for various parameters can be set according to the requirements by entering the correct password.
- c) PLC CONFIGURATION - After entering the password, the following functions can be accessed:

DIGITAL INPUT CONF

Digital Input pins (1-8) can be configured with the different operations like forward, reverse, jog etc.

ANALOG INPUT CONF

First, the control mode of operation is selected from FREQ CONTROL. This function is used to set value of maximum, minimum and time delay of voltage and current sense. Input reference voltage and current range is 0-10V and 4-20 mA RESPECTIVELY. Time delay can also be set from this function.

FREQ CONTROL CONF

The settings in this configuration decides which external input governs the set frequency. The set frequency of the drive can be changed on the fly based on various inputs, one at a time. The possible inputs can be external or internal. The external inputs are,

- A) VS control (Analog voltage as control input),
- B) Current control (4-20 mA analog current as control input),
- C) RS485 (RPM CONTROL/FREQ CONTROL)

The set speed can also be controlled internally via DISPLAY

ACCELERATION CONF

Time taken by the motor to reach to set speed.

DECCELERATION CONF

Time taken by the motor to turn off from set speed.

DISPLAY FREQ CONF:

If display based frequency control is opted in iii, then the DISPLAY FREQ CONF decides the set speed.

- c) FACTORY SETUP - A security password is required to access this menu block.
 - i. SOLAR PARAMETERS - According to PV panels connected to the system parameters shown in the figure 4.6 can be set.
 - ii. MOTOR PARAMETERS - First the type of the motor is selected and by entering into the selected motor the rated parameters of that specific motor can be set.
 - iii. PUMP PARAMETERS - After selecting the pump to be operated the parameters specific to that pump can be configured.
 - iv. CONTROL PARAMETERS - The number of options available under control parameters varies with different models of the product.
The Toggle Switch is provided in customized models which provides the facility of turning ON and OFF the pump without operating the LCD power button.
 - v. DONGLE DATA CONFIGURATION - Erasing dongle data can be done by authorized technician/service personnel. Users are not allowed to erase the data of the dongle.
 - vi. EEPROM RESET - EEPROM can be reset only by authorized technician/service personnel. Users are not allowed to reset the EEPROM since it may cause malfunctioning of the unit.

INSTALLATION & OPERATING INSTRUCTIONS

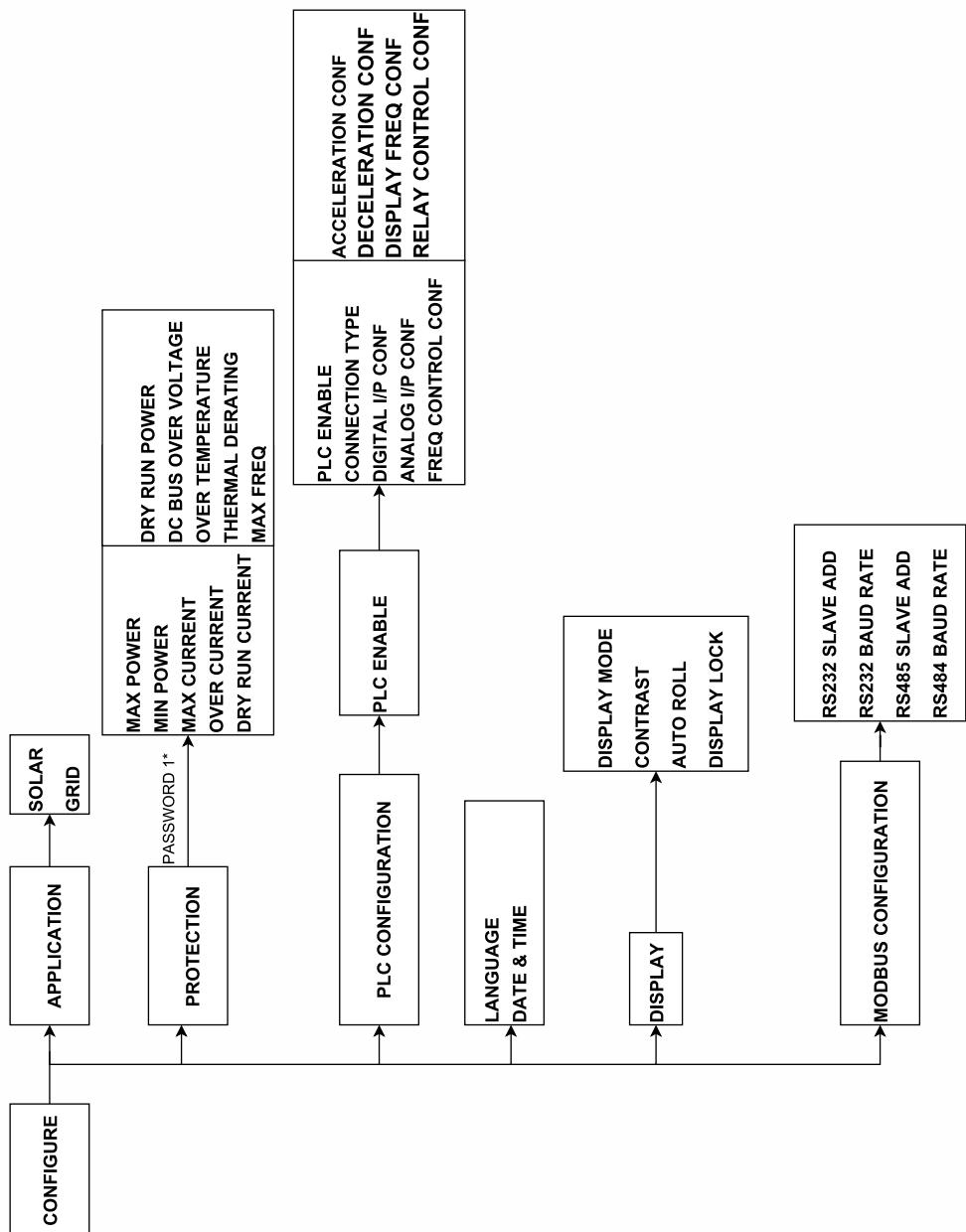


Figure 4.6 Configure menu tree

INSTALLATION & OPERATING INSTRUCTIONS

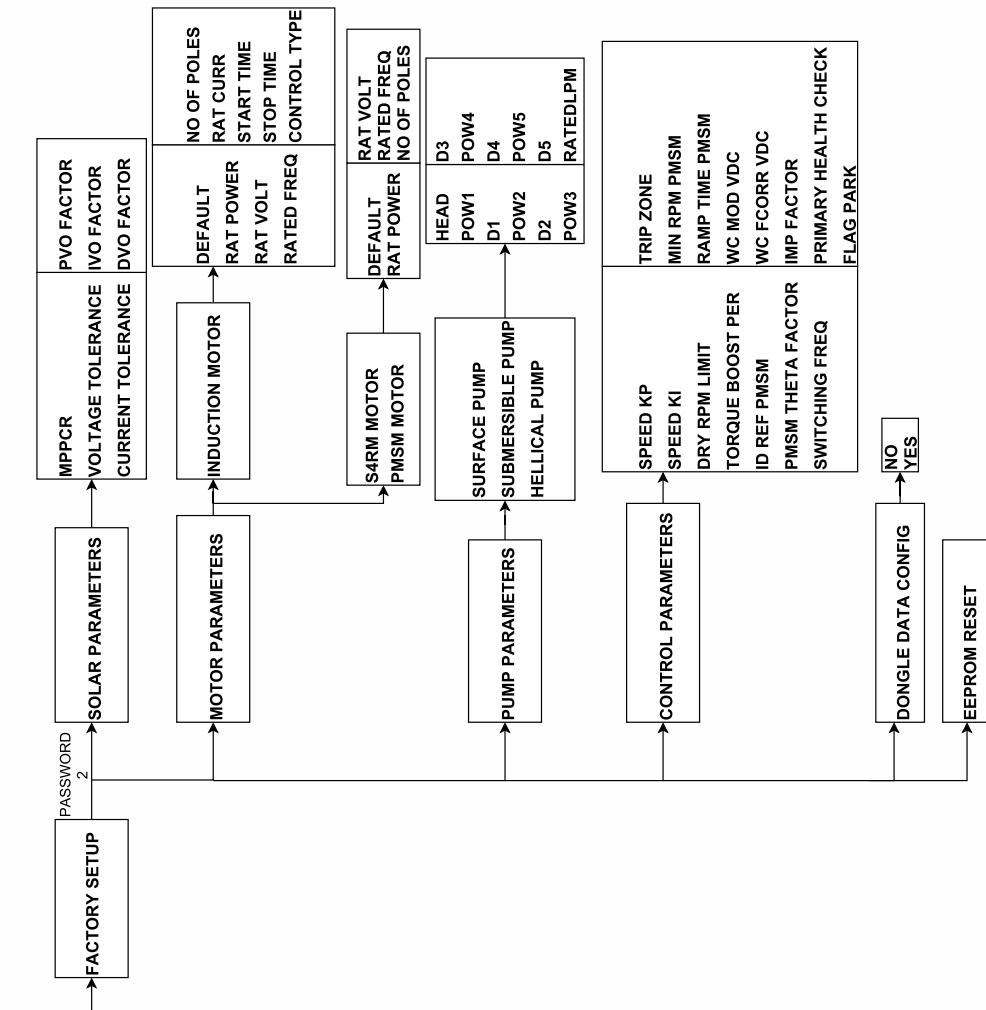


Figure 4.6 Configure menu tree

CHAPTER 5 FAULT DIAGNOSIS AND SOLUTION

This chapter describes the drive faults, related messages on LCD display, possible reasons of fault and their troubleshooting.

5.1 Fault Type

| Type | Drive action when fault happen |
|----------------|--|
| Drive fault | If any fault is detected it will occur in following manner <ul style="list-style-type: none"> Fault information will be shown at LCD display Output of drive will be cut-off and motor will decelerate and stop. |
| External fault | For monitoring and protecting drive external signal can be given which can trip the drive. |

Table 5.1 Fault type

Note : In case of remote monitoring the motor will not turn on and the fault status can be seen in menu under fault report.

If the short circuit fault occurs:

1. Remove the motor connection and run the drive.
2. If the drive runs OK
 - a. Check the loose connection of motor wire in the connector side, some strands may be touching.
 - b. Check the cable for the motor.
 - c. Check the megger of the motor and motor winding related problems.

Reason for low power and DC bus under voltage:

1. Check dust deposition on the solar panel.
2. Check the direction of solar panels.

5.1.1 Fault information and description in detail

| Fault Type | LCD Display Message | Possibility Reason/s (reasons do not limit to the following given reasons) | Troubleshooting |
|---|---|--|---|
| DC Bus Overvoltage |  DC BUS OVERVOLTAGE | 1. DC bus voltage in the drive is more than the voltage set (720 V PV cell max voltage). | 1. Check the no. of PV cells connected in series. 2. Make sure the voltage is less than the voltage mentioned in the specification sheet on page no. 7 3. Contact customer care |
| High Inrush Current |  HIGH INRUSH CURRENT | 1. Sudden increase in load 2. Wrong motor selected. 3. Cable joint not proper. | 1. Select the proper motor and also select correct motor in menu. 2. Make proper joint of cable. 3. Contact customer care |
| Short Circuit Trip |  SHORT CIRCUIT TRIP | 1. Any of the connection internal or output is shorted. 2. Voltage is too low 3. A sudden load is added during operation. 4. Drive model is of too small power class. | 1. Correct shorted connection 2. Check insulation health of cable 3. Contact Customer Care |
| Dry Run |  DRY RUN DETECTED | 1. No water available on the suction/inlet side of pump | 1. Check for availability of water at pump inlet. 2. Wait for water to come in, in case of submersible motor. 3. Check water level in water tank in case of surface motor. 4. Kindly do the priming properly |
| Over Temperature |  OVER TEMP PROTECTED | 1. The drive heating is more than expected. 2. Improper ventilation | 1. Check for ventilation and mounting style 2. Contact Customer Care |
| *Low Power (Input power is lesser than set min power) |  LOW POWER | 1. Low input power due to lesser intensity of sunlight or shadow on panels. 2. PV panels may not be in healthy condition. | 1. Check if there low intensity of sunlight. If yes wait till proper sunlight come. |
| Over Current at Output (RMS value of Output current more than set value in drive parameters in factory setup) |  OVER CURRENT DETECTED | 1. Wrong values set (for rated current) in the factory setup. 2. Mismatch of connected load and selected parameters. | 1. Set right value in the rated current parameter. 2. Check the output load connected. 3. Contact Customer care |
| *SOFT RESET | DISPLAY BLANK | 1. Display goes into sleep Mode | 1. Need to long press the ESC button |

*This is not a fault but a warning.
Table 5.2 Fault information and description

CHAPTER 6 : SIMHA MODBUS COMMUNICATION PROTOCOL

6.1 COM Port Setting:-

- RS485 in half duplex mode
- Port Setting:- Baud Rate -9600, Data Bits-8, Stop Bits-1, Parity-None

6.2 RTU Frame Structure:-

Slave address 0X01

Function field 0x03 :Read single parameter

0x06 : Write single parameter

Data field Data field includes address field and data load domain

CRC field 16bit CRC check value

6.2.1 Function code: 0X03

This function code is used to read the contents of a contiguous block of registers but in Simha 2.0 only single register can be read, multiple read is not supported

| Request | Hex | Response | Hex |
|---------------------------------------|------|----------------------------|------|
| Slave address | 0X01 | Slave address | 0x01 |
| Command | 0x03 | Command | 0x03 |
| High bit of register starting address | 0X06 | Byte count | 0x02 |
| Low bit of register starting address | 0X01 | High bit of register value | 0X00 |
| High bit of register number | 0X00 | Low bit of register value | 0X01 |
| Low bit of register number | 0x01 | CRC low bit | — |
| CRC low bit | — | CRC high bit | — |
| CRC high bit | — | | |

Query—

| Slave Address | Function Code | Register Address High | Register Address Low | High Register No | Low Register No | CRC Low | CRC High |
|---------------|---------------|-----------------------|----------------------|------------------|-----------------|---------|----------|
| 0X01 | 0X03 | — | — | 0x00 | 0X01 | — | — |

Response—

| Slave Address | Function Code | Byte Count | High bit | Low bit | CRC Low | CRC High |
|---------------|---------------|------------|----------|---------|---------|----------|
| 0X01 | 0X03 | 0X02 | — | — | — | — |

Positive response

The response function code echoes the request function code

| Slave Address | Function Code | Register Address High | Register Address Low | High Register No | Low Register No | CRC Low | CRC High |
|---------------|---------------|-----------------------|----------------------|------------------|-----------------|---------|----------|
| 0X01 | 0X06 | — | — | 0x00 | 0X01 | — | — |

Note: If some error come then there is no response from drive

Minimum time interval between two request is 500ms

| S.No. | Configuration Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|--------------------------|---------------------|--------|-----|------|---------|--------------|------|--------------------------|
| 1 | FACTORY MODE | 256 | 1 | 0 | 1 | 1 | 1 | NA | FACTORY_MODE |
| 2 | LANGUAGE | 257 | 1 | 0 | 0 | 0 | 1 | NA | LANGUAGE_SELECTED |
| 3 | INSTALL DATE | 258 | 1 | 1 | 31 | 1 | 1 | NA | INST_DATE |
| 4 | INSTALL MONTH | 259 | 1 | 1 | 12 | 1 | 1 | NA | INST_MONTH |
| 5 | INSTALL YEAR | 260 | 1 | 18 | 99 | 21 | 1 | NA | INST_YEAR |
| 6 | APPLICATION | 261 | 1 | 0 | 1 | 0 | 1 | NA | APP_MODE |
| 7 | ROLLING PAGE ENABLE | 262 | 1 | 1 | 2 | 1 | 1 | NA | ROLLING_PAGE_ENABLE |
| 8 | LCD CONTRAST | 263 | 1 | 27 | 39 | 33 | 1 | % | LCD_CONTRAST |
| 9 | DISPLAY MODE | 264 | 1 | 1 | 2 | 1 | 1 | NA | DISPLAY_MODE_FLAG |
| 10 | ENERGY ERASE FLAG | 265 | 1 | 0 | 2 | 2 | 1 | NA | ENERGY_ERASE_FLAG |
| 11 | FAULT ADDRESS POINTER | 266 | 1 | 0 | 255 | 0 | 1 | NA | Fault_Address_Pointer |
| 12 | DATE | 267 | 1 | 1 | 31 | 1 | 1 | NA | date |
| 13 | MONTH | 268 | 1 | 1 | 12 | 1 | 1 | NA | month |
| 14 | YEAR | 269 | 1 | 1 | 99 | 1 | 1 | NA | year |
| 15 | ON HOUR MOTOR | 270 | 1 | 1 | 12 | 1 | 1 | NA | ON_HOUR_MOTOR |
| 16 | ON MINUTE MOTOR | 271 | 1 | 0 | 59 | 1 | 1 | NA | ON_MINUTE_MOTOR |
| 17 | OFF HOUR MOTOR | 272 | 1 | 1 | 12 | 1 | 1 | NA | OFF_HOUR_MOTOR |
| 18 | OFF MINUTE MOTOR | 273 | 1 | 0 | 59 | 1 | 1 | NA | OFF_MINUTE_MOTOR |
| 19 | EEPROM ERASE FLAG | 274 | 1 | 0 | 1 | 1 | 1 | NA | EEPROM_ERASE_FLAG |
| 20 | RS232 BAUD RATE | 275 | 1 | 1 | 6 | 2 | 1 | NA | RS232_BAUD_RATE |
| 21 | RS485 BAUD RATE | 276 | 1 | 1 | 6 | 2 | 1 | NA | RS485_BAUD_RATE |
| 22 | MODBUS ADD RS232 | 277 | 2 | 1 | 99 | 1 | 1 | NA | MODBUS_ADD_RS232 |
| 23 | MODBUS ADD RS485 | 279 | 2 | 1 | 99 | 1 | 1 | NA | MODBUS_ADD_RS485 |
| 24 | PASSWORD CHECK | 281 | 2 | 0 | 9999 | 8443 | 1 | NA | PASSWORD_CHECK |
| 25 | EEPROM PASSWORD CHECK | 283 | 2 | 0 | 9999 | 3939 | 1 | NA | EEPROM_PASSWORD_CHECK |
| 26 | TIMER ENABLE FLAG | 285 | 1 | 0 | 1 | 0 | 1 | NA | TIMER_ENABLE_FLAG |
| 27 | TIMER TYPE | 286 | 1 | 0 | 1 | 0 | 1 | NA | TIMER_TYPE |
| 28 | SCHEDULE OVER FLAG | 287 | 1 | 0 | 1 | 0 | 1 | NA | SCHEDULE_OVER_FLAG |
| 29 | COUNTDOWN START CHECK | 288 | 1 | 0 | 1 | 0 | 1 | NA | COUNTDOWN_START_CHECK |
| 30 | DISPLAY LOCK | 289 | 1 | 1 | 2 | 2 | 1 | NA | DISPLAY_LOCK_ENABLE |
| 31 | DISPLAY PASSWORD CHECK | 290 | 2 | 0 | 999 | 345 | 1 | NA | DISPLAY_PASSWORD_CHECK |
| 32 | COUNTDOWN TIMER DURATION | 292 | 2 | 1 | 999 | 1 | 1 | Min | COUNTDOWN_TIMER_DURATION |
| 33 | MON SET TIME | 294 | 2 | 0 | 2400 | 1 | 1 | Min | MON_SET_TIME |
| 34 | MON TIME DURATION | 296 | 2 | 1 | 999 | 1 | 1 | Min | MON_TIME_DURATION |
| 35 | TUE SET TIME | 298 | 2 | 0 | 2400 | 1 | 1 | Min | TUE_SET_TIME |
| 36 | TUE TIME DURATION | 300 | 2 | 1 | 999 | 1 | 1 | Min | TUE_TIME_DURATION |
| 37 | WED SET TIME | 302 | 2 | 0 | 2400 | 1 | 1 | Min | WED_SET_TIME |
| 38 | WED TIME DURATION | 304 | 2 | 1 | 999 | 1 | 1 | Min | WED_TIME_DURATION |
| 39 | THR SET TIME | 306 | 2 | 0 | 2400 | 1 | 1 | Min | THR_SET_TIME |
| 40 | THR TIME DURATION | 308 | 2 | 1 | 999 | 1 | 1 | Min | THR_TIME_DURATION |
| 41 | FRI SET TIME | 310 | 2 | 0 | 2400 | 1 | 1 | Min | FRI_SET_TIME |
| 42 | FRI TIME DURATION | 312 | 2 | 1 | 999 | 1 | 1 | Min | FRI_TIME_DURATION |
| 43 | SAT SET TIME | 314 | 2 | 0 | 2400 | 1 | 1 | Min | SAT_SET_TIME |
| 44 | SAT TIME DURATION | 316 | 2 | 1 | 999 | 1 | 1 | Min | SAT_TIME_DURATION |
| 45 | SUN SET TIME | 318 | 2 | 0 | 2400 | 1 | 1 | Min | SUN_SET_TIME |
| 46 | SUN TIME DURATION | 320 | 2 | 1 | 999 | 1 | 1 | Min | SUN_TIME_DURATION |
| 47 | SCHEDULE MINUTE PASSED | 322 | 2 | 0 | 999 | 0 | 1 | Min | SCHEDULE_MINUTE_PASSED |

INSTALLATION & OPERATING INSTRUCTIONS

INSTALLATION & OPERATING INSTRUCTIONS



| S.No. | VFD Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|---------------------|---------------------|--------|-----|------|---------|--------------|------|-------------------------|
| 1 | MASTER ON OFF | 1000 | 1 | 0 | 1 | 0 | 1 | NA | MASTER_ON_OFF |
| 2 | CONTROL MODE | 1001 | 1 | 1 | 5 | 2 | 1 | NA | SPEED_MODE_SELECT |
| 3 | DIRECTION | 1002 | 1 | 1 | 2 | 1 | 1 | NA | SPEED_DIRECTION_SELECT |
| 4 | LOCK_UNLOCK | 1003 | 1 | 0 | 1 | 0 | 1 | NA | LOCK_UNLOCK |
| 5 | MIN POWER | 1004 | 2 | 25 | 1500 | 360 | 1 | W | MIN_PV_POWER |
| 6 | MAX CURRENT | 1006 | 2 | 1 | 40 | 22 | 1 | A | MAX_CURRENT |
| 7 | OVER CURRENT | 1008 | 2 | 2 | 31 | 12 | 1 | A | OVER_CURR_LIMIT |
| 8 | DRY RUN CURRENT | 1010 | 2 | 1 | 16 | 5 | 1 | A | DRY_RUN_LIMIT |
| 9 | DRY RUN POWER | 1012 | 2 | 25 | 8000 | 200 | 1 | W | DRY_RUN_POWER |
| 10 | DC BUS OVER VOLTAGE | 1014 | 2 | 150 | 770 | 770 | 1 | V | DC_BUS_OV_LIMIT |
| 11 | OVER TEMPERATURE | 1016 | 2 | 40 | 115 | 110 | 1 | °C | OVER_TEMP_LIMIT |
| 12 | THERMAL DERATING | 1018 | 2 | 0 | 200 | 100 | 1 | % | THERMAL_DERATING_FACTOR |
| 13 | MAX FREQ | 1020 | 2 | 1 | 400 | 240 | 1 | Hz | MAX_FREQ_SET |

| S.No. | Motor Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|---------------------------|---------------------|--------|-----|------|---------|--------------|------|-------------------------|
| 1 | MOTOR TYPE | 2000 | 1 | 0 | 2 | 2 | 1 | NA | MOTOR_TYPE |
| 2 | CONTROL TYPE | 2001 | 1 | 0 | 1 | 0 | 1 | NA | CONTROL_TYPE |
| 3 | TORQUE PERCENT | 2002 | 2 | 0 | 2 | 2 | 1 | % | TORQUE_PERCENT |
| 4 | POWER FACTOR | 2004 | 2 | 60 | 100 | 75 | 1 | NA | POWER_FACTOR |
| 5 | RATED POWER | 2006 | 2 | 1 | 15 | 10 | 10 | HP | MOTOR_POWER |
| 6 | RATED CURRENT | 2008 | 2 | 1 | 20 | 12 | 1 | A | MOTOR_RATED_I |
| 7 | LEAKAGE INDUCTANCE | 2010 | 2 | 5 | 999 | 56 | 1 | H | Ls |
| 8 | MAGNETIC INDUCTANCE | 2012 | 2 | 20 | 9999 | 881 | 1 | H | Lm |
| 9 | ROTOR RESISTANCE | 2014 | 2 | 20 | 9999 | 33 | 1 | Ohm | Rr |
| 10 | STATOR RESISTANCE | 2016 | 2 | 20 | 9999 | 43 | 1 | Ohm | Rs |
| 11 | RATED VOLTAGE INDUCTION | 2018 | 2 | 30 | 460 | 456 | 1 | V | MOTOR_VOLTAGE_IND |
| 12 | RATED VOLTAGE S4RM | 2020 | 2 | 30 | 460 | 456 | 1 | V | MOTOR_VOLTAGE_S4RM |
| 13 | RATED VOLTAGE PMSM | 2022 | 2 | 30 | 460 | 360 | 1 | V | MOTOR_VOLTAGE_PM |
| 14 | RATED FREQUENCY INDUCTION | 2024 | 2 | 0 | 120 | 60 | 1 | Hz | MOTOR_RATED_FREQ_IND |
| 15 | RATED FREQUENCY S4RM | 2026 | 2 | 0 | 120 | 60 | 1 | Hz | MOTOR_RATED_FREQ_S4RM |
| 16 | RATED FREQUENCY PMSM | 2028 | 2 | 0 | 250 | 120 | 1 | Hz | MOTOR_RATED_FREQ_PMSM |
| 17 | NO OF POLES INDUCTION | 2030 | 2 | 2 | 8 | 2 | 1 | NA | IND_MOTOR_POLES |
| 18 | NO OF POLES S4RM | 2032 | 2 | 2 | 8 | 2 | 1 | NA | S4RM_MOTOR_POLES |
| 19 | NO OF POLES PMSM | 2034 | 2 | 2 | 8 | 4 | 1 | NA | PMSM_MOTOR_POLES |
| 20 | REFERENCE SPEED | 2036 | 2 | 1 | 3600 | 500 | 1 | RPM | SPEED_REF_INPUT_DISPLAY |
| 21 | START TIME | 2038 | 2 | 1 | 60 | 15 | 1 | Min | MOTOR_START_TIME |
| 22 | STOP TIME | 2040 | 2 | 1 | 60 | 15 | 1 | Min | MOTOR_STOP_TIME |
| 23 | FLAG PARK | 2042 | 1 | 1 | 2 | 2 | 1 | NA | FLAG_PARK |

| S.No. | Pump Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|-------------------|---------------------|--------|-----|------|---------|--------------|------|------------------|
| 1 | PUMP TYPE | 3000 | 1 | 0 | 2 | 1 | 1 | NA | PUMP_TYPE |
| 2 | PUMP HEAD | 3001 | 1 | 5 | 999 | 50 | 1 | m | PUMP_HEAD |
| 3 | POW1 | 3003 | 2 | 20 | 9999 | 1000 | 1 | W | POW1 |
| 4 | D1 | 3005 | 2 | 0 | 9999 | 80 | 1 | LPM | D1 |
| 5 | POW2 | 3007 | 2 | 20 | 9999 | 2000 | 1 | W | POW2 |
| 6 | D2 | 3009 | 2 | 0 | 9999 | 150 | 1 | LPM | D2 |
| 7 | POW3 | 3011 | 2 | 20 | 9999 | 3500 | 1 | W | POW3 |
| 8 | D3 | 3013 | 2 | 0 | 9999 | 250 | 1 | LPM | D3 |
| 9 | POW4 | 3015 | 2 | 20 | 9999 | 5500 | 1 | W | POW4 |
| 10 | D4 | 3017 | 2 | 0 | 9999 | 400 | 1 | LPM | D4 |
| 11 | POW5 | 3019 | 2 | 20 | 9999 | 7500 | 1 | W | POW5 |
| 12 | D5 | 3021 | 2 | 0 | 9999 | 500 | 1 | LPM | D5 |
| 13 | FLOW METER ENABLE | 3023 | 1 | 1 | 3 | 1 | 1 | NA | FLOW_METER_FLAG |
| 14 | FLOW METER VALUE | 3024 | 2 | 0 | 999 | 0 | 1 | LPM | FLOW_METER_VALUE |
| 15 | RATED LPM | 3026 | 2 | 0 | 1000 | 100 | 1 | LPM | RATED_LPM |

| S.No. | Solar Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|-------------------|---------------------|--------|-----|------|---------|--------------|------|----------------|
| 1 | MPPCR | 4000 | 2 | 10 | 9999 | 150 | 1 | NA | MPPT_CALL_RATE |
| 2 | VOLTAGE TOLERANCE | 4002 | 2 | 1 | 999 | 50 | 1 | NA | TOL_V |
| 3 | CURRENT TOLERANCE | 4004 | 2 | 1 | 999 | 60 | 1 | NA | TOL_I |
| 4 | PVO FACTOR | 4006 | 2 | 1 | 300 | 20 | 1 | W | VFD_VDC_KP |
| 5 | IVO FACTOR | 4008 | 2 | 0 | 500 | 50 | 1 | NA | VFD_VDC_KI |
| 6 | DVO FACTOR | 4010 | 2 | 20 | 700 | 300 | 1 | V | VFD_VDC_STEP |

| S.No. | Float Params | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|----------------|---------------------|--------|------|-------|---------|--------------|------|----------------|
| 1 | TOTAL TIME | 5000 | 3 | NA | NA | NA | 1 | Hr | TOTAL_TIME |
| 2 | TOTAL ENERGY | 5004 | 3 | NA | NA | NA | 1 | kWh | TOTAL_ENERGY |
| 3 | TOTAL FLOW | 5008 | 3 | NA | NA | NA | 1 | ML | TOTAL_FLOW |
| 4 | MAX POWER | 5012 | 3 | 200 | 15000 | 4800 | 1 | W | MAX_PV_POWER |
| 5 | SWITCHING FREQ | 5016 | 3 | 1600 | 16000 | 3200 | 1 | Hz | SWITCHING_FREQ |

| S.No. | Control Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|----------------------|---------------------|--------|-----|------|---------|--------------|------|-------------------------|
| 1 | TRIP ZONE | 7000 | 1 | 1 | 2 | 2 | 1 | NA | TZ_ENABLE_FLAG |
| 2 | PRIMARY HEALTH CHECK | 7001 | 1 | 1 | 2 | 1 | 1 | NA | HC_ENABLE_FLAG |
| 3 | TOGGLE SWITCH | 7002 | 1 | 1 | 2 | 2 | 1 | NA | TOGGLE_SWITCH_ENABLE |
| 4 | SPEED KP | 7003 | 2 | 0 | 1000 | 5 | 1 | NA | Speed_ErrorPI_PM_Kp |
| 5 | SPEED KI | 7005 | 2 | 0 | 1000 | 2 | 1 | NA | Speed_ErrorPI_PM_Ki |
| 6 | DRYRUN RPM LIMIT | 7007 | 2 | 0 | 9999 | 2500 | 1 | RPM | DRY_RUN_RPM_LIMIT |
| 7 | TORQUE BOOST PER | 7009 | 2 | 0 | 100 | 30 | 1 | NA | INIT_VOLTPERCENT_FACTOR |
| 8 | Id REF PMSM | 7011 | 2 | 0 | 200 | 0 | 1 | NA | Id_Ref_Pm |
| 9 | PMSM THETA FACTOR | 7013 | 2 | 0 | 50 | 0 | 1 | NA | PMSM_T_HETA_FACTOR |
| 10 | MIN RPM PMSM | 7015 | 2 | 200 | 999 | 500 | 1 | RPM | PMSM_MIN_RPM |
| 11 | RAMP TIME PMSM | 7017 | 2 | 30 | 400 | 30 | 1 | s | INIT_RAMP_TIME_PMSM |
| 12 | WC MOD VDC | 7019 | 2 | 10 | 4000 | 1000 | 1 | NA | LPF_CUTOFF_VDC_MOD |
| 13 | WC FCORR VDC | 7021 | 2 | 10 | 4000 | 400 | 1 | NA | LPF_CUTOFF_VDC_FCORR |
| 14 | IMP FACTOR | 7023 | 2 | 0 | 75 | 25 | 1 | NA | IMP_FACTOR |

INSTALLATION & OPERATING INSTRUCTIONS
INSTALLATION & OPERATING INSTRUCTIONS

| S.No. | PLC Parameters | MODBUS ADDRESS(DEC) | OFFSET | Min | Max | Default | Scale Factor | Unit | Description |
|-------|-----------------------------|---------------------|--------|-----|-----|---------|--------------|------|-----------------------------|
| 1 | PLC ENABLE | 6000 | 1 | 1 | 2 | 1 | 1 | NA | TERMINAL_MODE_SELECT |
| 2 | CONNECTION_TYPE | 6001 | 1 | 1 | 2 | 2 | 1 | NA | PLC_CONNECTION_TYPE |
| 3 | FREQ CONTROL CONF | 6002 | 1 | 1 | 5 | 1 | 1 | NA | FREQ_CONTROL_MODE |
| 4 | PLC IN1 | 6003 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN1 |
| 5 | PLC IN2 | 6004 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN2 |
| 6 | PLC IN3 | 6005 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN3 |
| 7 | PLC IN4 | 6006 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN4 |
| 8 | PLC IN5 | 6007 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN5 |
| 9 | PLC IN6 | 6008 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN6 |
| 10 | PLC IN7 | 6009 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN7 |
| 11 | PLC IN8 | 6010 | 1 | 1 | 16 | 1 | 1 | NA | PLC_IN8 |
| 12 | PLC IN1 SENSE DELAY | 6011 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN1_SENSE_DELAY |
| 13 | PLC IN2 SENSE DELAY | 6012 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN2_SENSE_DELAY |
| 14 | PLC IN3 SENSE DELAY | 6013 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN3_SENSE_DELAY |
| 15 | PLC IN4 SENSE DELAY | 6014 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN4_SENSE_DELAY |
| 16 | PLC IN5 SENSE DELAY | 6015 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN5_SENSE_DELAY |
| 17 | PLC IN6 SENSE DELAY | 6016 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN6_SENSE_DELAY |
| 18 | PLC IN7 SENSE DELAY | 6017 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN7_SENSE_DELAY |
| 19 | PLC IN8 SENSE DELAY | 6018 | 1 | 1 | 20 | 1 | 1 | NA | PLC_IN8_SENSE_DELAY |
| 20 | RELAY ONE ENABLE | 6019 | 1 | 0 | 2 | 0 | 1 | NA | RELAY_ONE_ENABLE |
| 21 | RELAY TWO ENABLE | 6020 | 1 | 0 | 2 | 0 | 1 | NA | RELAY_TWO_ENABLE |
| 22 | RELAY ONE FUN | 6021 | 1 | 0 | 3 | 0 | 1 | NA | RELAY_ONE_FUN |
| 23 | RELAY TWO FUN | 6022 | 1 | 0 | 3 | 0 | 1 | NA | RELAY_TWO_FUN |
| 24 | VOLTAGE SENSE MIN VALUE | 6023 | 2 | 0 | 100 | 0 | 1 | NA | Voltage sense min value |
| 25 | VOLTAGE SENSE MIN VALUE PER | 6025 | 2 | 0 | 30 | 0 | 1 | NA | Voltage sense min value per |
| 26 | VOLTAGE SENSE MAX VALUE | 6027 | 2 | 0 | 100 | 100 | 1 | NA | Voltage sense max value |
| 27 | VOLTAGE SENSE MAX VALUE PER | 6029 | 2 | 30 | 100 | 100 | 1 | NA | Voltage sense max value per |
| 28 | CURRENT SENSE MIN VALUE | 6031 | 2 | 40 | 200 | 40 | 1 | NA | Current sense min value |
| 29 | CURRENT SENSE MIN VALUE PER | 6033 | 2 | 0 | 30 | 0 | 1 | NA | Current sense min value per |
| 30 | CURRENT SENSE MAX VALUE | 6035 | 2 | 40 | 200 | 200 | 1 | NA | Current sense max value |
| 31 | CURRENT SENSE MAX VALUE PER | 6037 | 2 | 30 | 100 | 100 | 1 | NA | Current sense max value per |
| 32 | DELAY SENSING | 6039 | 2 | 20 | 900 | 30 | 1 | NA | Delay in sensing |

CHAPTER 7 : RECYCLING AND DISPOSAL

Electrical and electronic waste should not be thrown out in open or buried or fired. They must never be treated as residential waste. A drive which has reached end of its life or is not needed any more should be returned to the dealer or to the company. A user may also act as per the government norms prevailing in the area.

INSTALLATION & OPERATING INSTRUCTIONS
WARRANTY SERVICE

Shakti Pumps provides the warranty on this product as per Shakti Warranty Policy.

Warranty Conditions

If product gets fault and requires troubleshooting or for any kind of repair, kindly contact your dealer or company. To claim warranty kindly supply us the following:

1. Model and serial number of product.
2. Copy of invoice and warranty card.
3. Copy of installation report.
4. Message appearing on LCD display or any kind of information which could be helpful to resolve the fault.
5. Documents related to previous claims or exchanges.

Upon receiving such information Shakti Pumps will decide about the repair/exchange.

A. Company may send person from its factory

B. Or from its service centre.

C. Or offer an equivalent exchange as per the model and age.

In case of exchange, the remaining portion of the original warranty period will be transferred to the exchanged drive and it is to be noted that customer will not get any new warranty card/certificate. All such exchanges and repair will be documented.

In case of exchange, Shakti Pumps will send the replacement unit as soon as possible and the defective unit should be sent back to the nearest service centre or to the dealer or to the company if possible in its original packing conditions.

Service after warranty expiration will be as per Shakti Warranty policy.

Exclusion from warranty/liability

Kindly note the following conditions which cause exclusion from warranty/liability.

1. Customer has not sent warranty card to the dealer or to the company.
2. Customer has done any unauthorized modification or replacement or repair or maintenance.
3. Any attempt to change or erase model or serial number or seals of the product.
4. Failure to follow the safety instructions. (safety instructions are given in this manual)
5. Failure to properly store the drive. (Storage instructions are given in this manual)
6. Physical damage due to drop of equipment.
7. Failure to follow any kind of instructions given in this manual.
8. Improper use or misuse of the drive.
9. Insufficient ventilation of the drive.
10. Influence of foreign objects and force majeure (fire or lightning or severe weather or grid over voltage or natural calamities or animal attacks etc.)
11. The toggle switch is not covered under warranty.
12. This warranty excludes every condition whether statutory or otherwise, whatsoever not herein expressly set out.
13. For any further information please visit our website www.shaktipumps.com

INSTALLATION & OPERATING INSTRUCTIONS
WARRANTY CARD

Customer to fill following details

Name :
 Address :
 City/Village :
 District :
 State :
 Country :
 Pin Code :
 Mobile no. :
 Email id :

Information on Device:

Model no :
 Serial no. :
 Invoice no. :
 Commissioning date :
 Fault date and time :
 Message related to fault on display :
 Brief fault description and photo of display :
 Sign :
 Date :
 Place :

Installer to fill following details

Modules Used :
 Modules per string :
 Number of strings :
 Dealer license Number :
 Company :
 City/Village :
 State :
 Country :
 Pin Code :
 Mobile no. :
 Email id :
 Sign :
 Date :
 Place :

INSTALLATION & OPERATING INSTRUCTIONS

BOOK-POST

To,
SHAKTI PUMPS (INDIA) LIMITED
Plot No. 401, 402, & 413, Industrial Area, Sector - 3, Pithampur - 454774,
Dist. - Dhar, (M.P.) - INDIA, E-mail : info@shaktipumps.com
Visit us at : www.shaktipumps.com

